CLAIMS

1. In a wireless communication system, a method for preparing data for transmission on a plurality of transmission channels, wherein each transmission channel is operative to transmit a respective sequence of modulation symbols, the method comprising:

determining a number of information bits per modulation symbol supported by each transmission channel;

identifying a modulation scheme for each transmission channel such that the determined number of information bits per modulation symbol is supported;

determining a coding rate for each transmission channel based at least on the determined number of information bits per modulation symbol and the identified modulation scheme for the transmission channel, wherein at least two transmission channels are associated with different coding rates;

encoding a plurality of information bits in accordance with a particular encoding scheme to provide a plurality of coded bits;

puncturing the plurality of coded bits in accordance with a particular puncturing scheme to provide a number of unpunctured coded bits for the plurality of transmission channels; and

adjusting the puncturing to achieve the different coding rates for the at least two transmission channels.

2. The method of claim 1, wherein the wireless communication system is a multiple-input multiple-output (MIMO) system with a plurality of transmit antennas and a plurality of receive antennas.

3. The method of claim 1, wherein the wireless communication system is an orthogonal frequency division modulation (OFDM) communication system.

4. The method of claim 3, wherein the OFDM communication system is operated as a multiple-input multiple-output (MIMO) system with a plurality of transmit antennas and a plurality of receive antennas.

5. The method of claim 4, wherein the OFDM system is operative to transmit data on a plurality of frequency subchannels, and wherein each transmission channel corresponds to a spatial subchannel of a frequency subchannel in the OFDM system.

6. The method of claim 1, wherein the puncturing is based on transmission capabilities of the plurality of transmission channels.

7. The method of claim 6, wherein the transmission capabilities are determined from channel state information (CSI) derived for the plurality of transmission channels.

8. The method of claim 7, wherein the CSI includes signal-to-noise ratio (SNR) information for the plurality of transmission channels.

9. The method of claim 7, wherein the CSI includes information related to transmission characteristics from transmit antennas to the receive antennas.

10. The method of claim 7, wherein the CSI includes eigenmode information related to transmission characteristics from transmit antennas to the receive antennas.

11. The method of claim 6, further comprising:

grouping transmission channels having similar transmission capabilities to segments, and

wherein the puncturing is performed for each segment.

12. The method of claim 11, further comprising:

assigning a group of coded bits to each segment, and

wherein the puncturing is performed on the group of coded bits assigned to each segment.

13. The method of claim 11, wherein each segment includes transmission channels having SNR within a particular SNR range.

14. The method of claim 1, wherein the encoding is achieved via a Turbo code.

15. The method of claim 14, wherein the encoding provides a plurality of tail and parity bits for the plurality of information bits, and wherein the puncturing is performed on the plurality of tail and parity bits.

16. The method of claim 14, wherein the puncturing is performed such that unpunctured tail and parity bits are approximately evenly distributed over the plurality of information bits.

17. The method of claim 14, wherein the Turbo code includes two constituent codes operative to provide two streams of tail and parity bits, and wherein the puncturing is performed such that approximately equal number of tail and parity bits are deleted from the two streams of tail and parity bits.

18. The method of claim 1, wherein the coding rate for each transmission channel is selected to be between, and inclusive of, n/(n+1) and n/(n+2), where n is the number of information bits per modulation symbol supported by the transmission channel.

19. The method of claim 1, wherein the coding rate for each transmission channel is 1/2 or higher.

20. The method of claim 1, wherein the encoding is achieved via a convolutional code.

21. The method of claim 1, wherein the encoding is achieved via a block code.

22. The method of claim 1, further comprising:

inserting padding bits to fill available but unfilled bit positions in the plurality of transmission channels.

23. The method of claim 1, further comprising:

repeating at least some of the coded bits to fill available but unfilled bit positions in the plurality of transmission channels.

24. The method of claim 1, further comprising:

interleaving the plurality of coded bits.

25. The method of claim 24, wherein the puncturing is performed on interleaved coded bits.

26. The method of claim 24, wherein the encoding is achieved via a Turbo code comprised of two constituent codes, and wherein the plurality of

information bits, a plurality of tail and parity bits from a first constituent code, and a plurality of tail and parity bits from a second constituent code are separately interleaved.

27. The method of claim 1, further comprising:

forming non-binary symbols for the plurality of transmission channels, wherein each non-binary symbol includes a group of unpunctured coded bits; and

mapping each non-binary symbol to a respective modulation symbol.

28. The method of claim 27, further comprising:

interleaving the plurality of coded bits, and

wherein the non-binary symbols are formed from the interleaved coded bits.

29. The method of claim 27, wherein the modulation scheme for each transmission channel is associated with a respective signal constellation having a plurality of points, and wherein each modulation symbol is representative of a particular point in the signal constellation for the modulation scheme.

30. The method of claim 29, wherein the plurality of points in each signal constellation are assigned with values based on a particular Gray mapping scheme.

31. The method of claim 30, wherein the values are assigned to the plurality of points in each signal constellation such that values for adjacent points in the signal constellation differ by one bit position.

32. The method of claim 1, further comprising:

adapting to changes in the plurality of transmission channels by repeating the determining the number of information bits per modulation symbol, the identifying the modulation scheme, and the determining the coding rate.

33. The method of claim 1, wherein the modulation scheme for each transmission channel supports transmission of two or more coded bits per modulation symbol.

34. The method of claim 1, wherein the transmission on the plurality of transmission channels are intended for a single recipient receiving device.

35. In an orthogonal frequency division modulation (OFDM) communication system, a method for preparing data for transmission on a plurality of transmission channels, wherein each transmission channel is operative to transmit a respective sequence of modulation symbols, the method comprising:

determining a number of information bits per modulation symbol supported by each transmission channel;

identifying a modulation scheme for each transmission channel such that the determined number of information bits per modulation symbol is supported;

determining a coding rate for each transmission channel based at least on the determined number of information bits per modulation symbol and the identified modulation scheme for the transmission channel, wherein at least two transmission channels are associated with different coding rates;

encoding a plurality of information bits in accordance with a particular Turbo code to provide a plurality of tail and parity bits;

interleaving the plurality of information and tail and parity bits in accordance with a particular interleaving scheme;

puncturing the plurality of interleaved bits in accordance with a particular puncturing scheme to provide a number of unpunctured coded bits for the plurality of transmission channels, wherein the puncturing is adjusted to achieve the different coding rates for the at least two transmission channels;

forming non-binary symbols for the plurality of transmission channels, wherein each non-binary symbol includes a group of unpunctured coded bits; and

mapping each non-binary symbol to a respective modulation symbol.

36. A wireless communication system operative to transmit data on a plurality of transmission channels, wherein each transmission channel is used to transmit a respective sequence of modulation symbols, the system comprising:

an encoder configured to encode a plurality of information bits in accordance with a particular encoding scheme to provide a plurality of coded bits, and to puncture the plurality of coded bits in accordance with a particular puncturing scheme to provide a number of unpunctured coded bits for the plurality of transmission channels, wherein each transmission channel is

capable of transmitting a particular number of information bits per modulation symbol via a particular modulation scheme selected for the transmission channel, wherein each transmission channel is further associated with a particular coding rate based at least on the number of information bits per modulation symbol supported by the transmission channel and its modulation scheme, wherein at least two transmission channels are associated with different coding rates, and wherein the encoder is further configured to adjust the puncturing to achieve the different coding rates for the at least two transmission channels.

37. The system of claim 36, further comprising:

a channel interleaver coupled to the encoder and configured to interleave the plurality of coded bits, and

wherein the encoder is configured to puncture the interleaved bits.

38. The system of claim 37, further comprising:

a symbol mapping element coupled to the channel interleaver and configured to form non-binary symbols for the plurality of transmission channels, and to map each non-binary symbol to a respective modulation symbol, wherein each non-binary symbol includes a group of unpunctured coded bits.

39. The system of claim 38, further comprising:

a signal processor coupled to the symbol mapping element and configured to pre-condition the modulation symbols for the plurality of transmission channels to implement a multiple-input multiple-output (MIMO) transmission.